

who does not think of Euclid merely as a lower school subject? At the British Association discussion a great mathematician was astonished that I should ever have had to study the fifth book of Euclid. He said he was more fortunate, because he was never taught it. Well, I was never compelled to study it, but I took to it through mere affection such as my critic deems it his good fortune never to have experienced. What I regret is that any kind of demonstrative geometry was given me when a boy, but since it was given me I am glad to think that I had Euclid's philosophy undefiled. I even dipped into those books now never published—the seventh, eighth, ninth, tenth, and also the thirteenth, fourteenth, and the books added by some Greek author whose name I forget, the fifteenth and sixteenth. At the same time, I feel that if demonstrative geometry is to remain a school subject for the average boy, it is absolutely necessary to replace the second and fifth books by algebra. The view to which I hold most firmly of all my views about the teaching of mathematics is that demonstrative geometry ought never to be taught to boys at all; it ought never to be taught in schools. It is a higher university subject. Euclid's treatment of proportion and of incommensurables is one of the most beautiful parts of that exact philosophy which the conventional schoolmasters are constantly seeking to degrade. The old philosophers thought that only a very few men of the most acute race that ever lived on this earth were fit to begin the study of geometry, and we use it as "an instrument for the cultivation of the mind" of the average young barbarian. Even my sense of the parlous state of the country cannot prevent me from grinning at the Rabelaisian humour of the position. Boys are not swine, but if you will force pearls upon them for food (poor boys, they do not know that the pearls are only cheap imitations) you must expect but small results either physically or spiritually. It must always be a pleasant memory to them, however, that they once did have pearls to trample under foot or to give them indigestion, and one may say that they are fairly safe from pearl hunger all the rest of their lives. Will any of my opponents deny that they ceased to study Euclid when they left school, except in the way of their trade as teachers? How many of them know anything of—I need not say Euclid's real philosophy—but even of modern geometry and the beautiful system of transversals developed by the Irish geometers? I recollect a lovely year of my life in which I was introduced to three new things—Tennyson's "Idylls" and McDowell's "Geometry" and Homer's "Odyssey" (Bohn's translation), and I hardly know even now which of the three gave me most pleasure. But I had had the good fortune not to have pearls forced upon me as a boy. Yes, Cæsar wrote a book for the third form; what man who ever passed through the third form would now read Cæsar? Euclid wrote a book for the lower school; a lower school book let it remain.

And $(a+b)^2 = a^2 + 2ab + b^2$ is equivalent to II. 4. And if $\frac{a}{b} = \frac{c}{d}$, then $\frac{ma+nb}{pa+qb} = \frac{mc+nd}{pc+qd}$, and this is equivalent to the immortal philosophy of the fifth book. "Great God, I'd rather be a pagan cradled in a creed outworn!" I would rather be utterly ignorant of all the wonderful literature and science of the last twenty-four centuries, even of the wonderful achievements of the last fifty years, than not to have the sense that our whole system of so-called education is as degrading to literature and philosophy as it is to English boys and men.

We are not the heirs of all the ages, and we shall not for very long remain in the foremost files of our time if we depend upon the schoolmasters. I place my faith in the common sense of the common people. In one way or another I find that they are learning to compute, to gain a knowledge of natural science. I know of many hundreds of night-school boys who were poor who are now successful engineers, and already youths are being

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warned from trying to become engineers because their public school education would actually prevent their having a chance of success. They cannot understand the most elementary lectures in applied science. I know of a large employer who has already told the headmaster of a great public school that he will no longer employ public school boys unless a more rational method of teaching mathematics is adopted. And he is a public school boy himself! I am constantly being asked to recommend men to teach mathematics in technical schools and colleges, and warned that I must not recommend a Cambridge man. There is nobody who has a higher respect for Cambridge mathematics, for the achievements of past and present Cambridge men, than I have; but if Cambridge men will put themselves altogether out of sympathy with the needs of young engineers; if they will make no attempt whatsoever to look at things from the new point of view to which we have been forced; if without any attempt at examination they will in an off-hand way settle it that what we ask for is an illogical and soul-debasing non-educational preparation of an olla podrida of mere formulæ, then in sorrow and not without some anger we must try to get on without them. They do not know what a lovely bit of fighting they are leaving us to do all by ourselves, but I sincerely hope that they will not hamper us. Indeed, they must sooner or later help us against the common enemy, even if they are only to be armed as were the children of the mist. Because Isaac Newton was such a superb bowman and the English yew was ever the finest of materials, they will insist on the use of the antiquated weapon only. I sincerely hope that the English yew, which is very much of a graveyard tree, may not yet flourish over the grave of British industry.

But enough of these notions. I see a great fight ahead of our people, and bows and arrows are better than no weapons, as a twentieth of a loaf is better than no bread at all, and I welcome any instalment of reform, however small, in the teaching of mathematics in the public schools of England. And so long as my help is not rejected on the ground that I openly ask for a much greater reform and may be dangerous to my friends on that account, so long am I anxious to give my help and proud that it should be accepted.

JOHN PERRY.

Birds attacking Butterflies and Moths.

WITH reference to my previous letter in NATURE (January 16), I would say that the butterfly referred to was the *Terias silhetana* or *Terias laeta*, probably both.

Another bird that frequently catches these butterflies on the wing is the Indian Bee Eater (*Merops viridis*).

During a Christmas camp this season I came across a field where some twenty or thirty King Crows were busily engaged in catching butterflies; the day I first saw them, butterflies were numerous in this field, and it was easy to get undamaged specimens of *Terias silhetana*, *Terias laeta*, *Junonia lemonias*, *Tarucus theophrastus*, *Lampides elpis*, *Catopsilia pyranthe*, and some others which were not being caught in flight. Some three or four days later few King Crows were to be seen, the butterflies were much diminished in number, and nearly all those caught were damaged specimens. The birds perched on the tall dry Jowari stalks and made short flights on all sides, catching their prey sometimes on the wing, sometimes on the ground.

I could not say with certainty what butterflies were caught on the wing.

The King Crow and the Bee Eater are two of the commonest birds in this part of the country, and must cause a good deal of destruction in the course of a year.

ANNIE E. MCKAY.

India, February 21.

"Nature-Study" Exhibition.

WILL you kindly permit me, while thanking you for the attention which you have already directed towards the above exhibition, to state that it has now been arranged to hold it at

the gardens of the Royal Botanic Society, Regent's Park, on July 23 and following days? It will be open to colleges and schools of every grade, and the exhibits will include all that bears upon Nature-study. Happily the project has secured very influential support, and has aroused considerable interest.

Sir John Cockburn, K.C.M.G., is chairman of the executive committee, and Mr. Charles Savile Roundell, of 7 Sussex Square, Brighton, is hon. treasurer.

I shall be happy to furnish full particulars, or to meet anyone, who may wish to see me personally, at any time by appointment either at the Botanic Gardens or in St. James's Street, S.W.

JOHN C. MEDD
(Hon. Sec., *pro tem.*).

Stratton, near Cirencester, March 19.

Sounds associated with Low Temperatures.

The accompanying extract from a letter recently received from Norwich raises a question that I cannot answer. I have never experienced the fact named. Have any of your correspondents ever done so?

W. H. PREECE.

"On February 18 the temperature went down to zero here. As my son walked about the sheds, he was struck by the whistling noise the ground made, which he says he has noticed each time such an extremely low temperature has occurred, and he reminded me how we had once noticed it together a great many years ago. Now what makes that whistling, and does it always accompany a zero frost?"

Proofs of Euclid I. 5.

I REGRET that in my letter of March 13 (p. 439, line 4) the letters A, B were inadvertently used by me instead of B, C.

I have tried Mr. Croome-Smith's proof (NATURE, March 20, p. 466) on a class of beginners, but it is difficult to convince them that, in the words of the professional conjurer, "there is no deception."

A non-mathematical friend has just written, pointing out that so long as we define a square as a four-sided figure having all its sides equal and all its angles right angles, it is somewhat inconsistent to trouble the beginner with proving properties of an isosceles triangle the truth of which he can readily see for himself at a glance. Either we should make him prove the properties of a square or we might just as well define an isosceles triangle as a triangle having two sides equal, and the angles opposite these sides equal.

G. H. BRYAN.

THE NATIONAL PHYSICAL LABORATORY.

THE Prince of Wales, who was accompanied by the Princess, formally opened the National Physical Laboratory on March 19, in the presence of a distinguished company of men of science and others interested in national progress. In declaring the laboratory open, His Royal Highness said:—

I am glad that my first duty as a Fellow of the Royal Society should be to join with my distinguished brethren in opening this institution, the direction and administration of which have been entrusted to the Society by the Government. It is also a great pleasure to assist in the inauguration of what may fairly be called a new departure, for I believe that in the National Physical Laboratory we have almost the first instance of the State taking part in scientific research. The object of the scheme is, I understand, to bring scientific knowledge to bear practically upon our everyday industrial and commercial life, to break down the barrier between theory and practice, to effect a union between science and commerce. This afternoon's ceremony is not merely a meeting of the representatives of an ancient and world-renowned scientific society for the purpose of taking over a new theatre of investigation and research. Is it not more than this? Does it not show in a very practical way that the nation is beginning to recognise that if her commercial supremacy is to be maintained greater facilities must be given for furthering the application of science to commerce and manufacture? In the profession to which I am proud to belong there are, perhaps, special opportunities of gaining a certain insight into the general trade and commerce of the world and of comparing the

commercial vitality of the different countries. And certainly abroad one finds an existing impression, which was confirmed by the experience of my recent and interesting colonial tour, that the superior technical and scientific knowledge of our foreign competitors is one reason why our hitherto preeminent position in manufactures and commerce is so considerably threatened. As a simple example I may quote the opinion of an expert authority in Australia, that the aniline dyes of Germany had given to a certain class of German-made goods a decided superiority over those of British manufacture. In Germany and America much valuable work has been carried out by the State. In this country the Government have provided these buildings and found machinery for the supply of light, heat and power. They are at present not inclined to spend more money upon equipping the laboratories. It is therefore to the liberality of the public that we must look, not only for money, but for presents in machinery and necessary appliances. Already the institution has benefited in the latter respect by gifts from Sir Andrew Noble, the Drapers' Company, Messrs. Willans and Robinson, Lady Galton, and others. The old-established Kew Observatory now forms part of the laboratory. Important and growing work is carried out in the testing of telescopes, binoculars, sextants and, more particularly, telescopic sights for the Navy. Most of the scientific outfit supplied for the Antarctic expedition was tested at Kew. The laboratory will also supply a want which is much felt for standardising and testing the many other forms of apparatus in daily use, while investigations will be carried out on points of importance to the manufacturer or the merchant from the solution of which valuable results may be expected to accrue. I am particularly pleased to know that it is possible that within the precincts of this laboratory there will be established a work of the utmost importance—namely, a tank after the design of the late Mr. Froude, in which the performance of a ship can be predicted from experiments on a model. At present there is such a tank at Haslar, which is fully occupied in Government work. The Institution of Naval Architects, impressed with the demand for this work, have proposed to raise the sum required to erect the tank and for the necessary appliances. But the funds at present at the disposal of the laboratory will require to be considerably supplemented if they are to undertake this much-needed work. No doubt the working expenses of the tank will ultimately be met by fees. But a difficulty may arise in tiding over the interval which must elapse before such fees are available. I am confident that, through the generosity of the public, the necessary means will be forthcoming to meet these difficulties and to secure that which is almost an essential to the ship-building industry of a country possessing the largest mercantile marine in the world. Before such an audience I have not presumed to speak of the value to science of this institution. Though the Navy has given many notable names to scientific theory, it is the practical results which naturally appeal more to the mind of the sailor, and I am sure you will accept this as my excuse for having ventured to make my few remarks upon the future of this institution from merely a utilitarian point of view.

At the close of the ceremony, in responding to the vote of thanks, the Prince of Wales announced that Sir William Armstrong, Whitworth and Co. had promised to subscribe 1000/- towards the funds of the laboratory; and he expressed the hope, which all of us share, that this excellent example will be promptly followed by other manufacturing firms. We give below some particulars of the work already instituted at the laboratory.

The opening ceremony took place in the engineering laboratory, in which about 900 guests were accommodated. This had been cleared for the occasion, and the only machines left in position were a shaping machine by Baker and Co., of Halifax, and a ten-ton testing machine. The latter is one of Messrs. Buckton's vertical machines. The stress is applied direct by means of a hydraulic ram worked off the main, in which there is about 100 feet of water pressure, so that no intensifier is necessary; the supply from a small cistern fixed to the wall is sufficient to bring the ram back when the pressure is relieved. The machine is intended primarily for experimental work in connection with the alloys research; for this it has conveniences which a more powerful instrument